Functional Aspects of Verbs in Scientific Writing

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Abstract

The study highlights the semantic variations of verbs used in scientific writing. Although, there is no rigid rule in grammar regarding the use of semantically varying verbs in written technical communication; however, the behavioural pattern of verbs, with their effective usage, may add to the purpose for which they have been used. A particular verb, if used in another similar context, may distort the exact meaning. An array of examples has been drawn to drive home the fact. Further, it has also been taken into consideration the use of infinitive, gerund, prefixes and dental prefixes as necessary accompaniments of verbs used in science. One of the cardinal features of scientific writing is the exhaustive use of phrasal verbs. Use of verbs with prepositions added to them acquires new meaning and expands and enriches the frontiers of technical writing. The user however, needs to develop familiarity with such usages which are often used in scientific and technical writing.

INTRODUCTION

It is universally accepted that a sentence cannot be conceived in the absence of a verb. It is the verb that gives dynamism and immediacy of speech to the sentence. Think of a sentence as a machine, and the verb as the engine that makes the machine work. Use of an appropriate verb in a sentence gives effectiveness in writing. It has been accurately pointed out by George Bernard Shaw that "effectiveness of assertion is the alpha and omega of a style" (Shaw, 1903), and quite justly the verbs justify the end product of any sentence in terms of establishing the right meaning. In the language of science, verbs are integral to the sentences as the verbs suggest action and all scientific writings are action oriented in specific terms. In literature, the

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use of verbs has some flexibility, but in scientific writing a particular verb is rooted in specificity.

Frequency indicates usefulness and usefulness is the main criterion for teaching. Verbs frequently used in scientific and/or technical writing show a wider and a more even distribution of usage. It also shows usage-habits of the scientists in so far as they represent features which figure prominently in scientific literature. As it has been said that verbs, "alone are certain good," (Yeats, 1961) the use of verbs while denoting action holds significance in the deliberation of science and technology. The present study is an attempt to study the various forms in which verbs are used in scientific writing. Since write-up in science demands precision, accuracy and balance in a sentence, sagacity and wisdom in the choice of verbs demands well directed exploration.

Narration of Verbs

An awareness of the relative frequency of occurrence would be of immense practical importance for the designers of teaching materials to stress the specific teaching point. For the sake of precision, it is desirable to classify these verbs as follows—

(i) Verbs that overlap and thus obscure the meaning
(ii) Verbs with '— ing' endings
(iii) Phrasal verbs
(iv) Verbs with dental suffix
(v) Helping verbs
(vi) Infinitive

Verbs that Overlap and Thus Obscure the Meaning

(i) Contain, consist, comprise, constitute, form, include.
(ii) Reduce, prevent, avoid, obviate, eliminate.
(iii) Move, travel, slide, run.
(iv) Employ, exploit, utilise, use.
(v) Adopt, employ, install, introduce.
(vi) Achieve, obtain, effect, accomplice.
(vii) Force, drive, impel, push, exert.
(viii) Conduct, communicate, transmit, broadcast
(ix) Approach, tackle, solve, deal.
(x) Arrange, dispose, order, plan, organise, design, set.
(xi) Determine, decide, govern, fix.
(xii) Agree, accord, conform, comply.
(xiii) Adjust, modify, transform, adapt.
(xiv) Estimate, gauge, judge, deduce, etc. (Fowler, 1965)

Close analysis of scientific and technical literature will show more such sets of verbs. They are used to express the specialised meanings or different shades, and thus function as signals helping the readers or listeners to a proper appreciation of statements made in their intimate contexts.

In (i) 'contain', 'consist', 'comprise', 'constitute', 'form', 'include', etc., have dispositions to behave in certain ways. The flask 'contains' a very small amount of water. The atom 'comprises' of a nucleus and electrons moving round it in space. The compound strip 'consists' of two strips riveted together, one of iron and the other of copper. A number of

gases 'form' the atmosphere. Twenty students 'constitute' the practical class. Metals which we use widely in industry 'include' aluminium and steel. From the above examples, it is clear that each one of these verbs has specialised meaning or function, and unless one knows how to differentiate between them, it will be difficult to put across one's ideas correctly. In scientific and technical concepts, they almost hold the key-points, without which the technical activities or processes will hardly get expressed in suitable and clear terms.

In ii and iii, the verbs though quite different in meaning and sometimes used in the same sentence convey ideas with different variables. These variables are indicators of results that follow due to certain endeavours as in the following sentences:

Example for ii—

By taking precautions in the factory, we can—

reduce, prevent, avoid, obviate, eliminate the danger of accident

Example for iii—

The piston:

moves, travels, slides, runs forward

Note: The travel of the piston is the distance it travels

Example for iv—

The properties of uranium are—

used, utilised, employed in nuclear reactions

The verb 'exploit' listed in iv, does not fit in this scheme because it conveys a different meaning altogether, and if used in the above sentence, it will look only absurd. "The country failed to exploit the natural resources." Here it is obvious that 'utilise', 'employ', and 'use' cannot replace 'exploit' in the sentence without distorting the meaning. The verbs used under v may be put at one place as in other substitution tables shown above to form meaningful sentences:

New methods of the production were—

adopted, employed, installed, introduced a few years ago

In the same manner the other sets of verbs listed in the next section may be used, but put in different contexts in order to express the different shades of meaning. These verbs may pose certain difficulties. They may be regarded as danger signals. They may even blur the sharp outlines, if not used with a discriminating mind.

Verbs with '—ing' Endings

The suffix '—ing' is used in a variety of meanings according to the contexts in which they occur. An oil pump delivers oil to the bearings, the oil then 'draining' into a sump. The starter motor is switched off, the engine, 'accelerating' under its own power. In these two sentences, the subject of the second part is different from the subject of the first part. Again, in the following sentence: The 'proton' is the opposite of 'electron', being a particle of positive electricity, 'being' has been used in place of 'since' and the subject of the second part is often the same as the subject of the first part.

"The compressor may not be able to maintain the delivery pressure, thus causing a reversal of flow." In this sentence 'causing' shows the result of the consequence of the first statement, and here, too, the subject of the second part is normally the same as the subject of the first part, and therefore, it is not expressed. Scientists are extremely fond of using the final '—ing' clause with a view to exercising economy or precision, and focussing the principal acts or processes in the whole operation.

Working procedures are commonly described in writing of scientific prose by unattached participles. For example,

(a) Multiplying the results we obtain the Fahrenheit temperature.
(b) Neglecting all radiation losses calculate the amount of steam required.
(c) Using these values of temperature, the value can be found.

In such sentences, where there is clear break between the participle and the rest of the sentence, the participle group forms what is known as a free-adjunct. In scientific writing and elsewhere the present participle in a free adjunct is preceded by a conjunction in the following manner:

"While experimenting with cathode rays, Roentgen found, that photographic plates had become spoiled."

Phrasal Verbs

Scientists have no fascination for phrasal verbs because most of the formal verbs used by them include adverbial idea. For example—

(a) The magnetic field appears to go round and round.
(b) These windings on the generator made up for the flux distinctions in the main field.
(c) The control rods are taken out of the reactor core by remote control.

In the above sentences, the phrasal verbs can be replaced by formal verbs such as 'rotate,' 'compensate' and 'removed' without any distortion of meaning. It is obvious that the writers of scientific literature employ formal verbs for the sake of precision and dignity. In fact, these formal verbs are an essential part of the jargon of science. However, some phrasal verbs used in science cannot be easily replaced by formal verbs as in the following examples:

(a) A film of oil is put between the metal surfaces, so that they do not bear on each other.
(b) The two ends of the tunnel link up in the middle.
(c) The supply of the motor is suddenly cut off.

It is extremely difficult to replace the phrasal verbs in the above sentences by formal verbs.

Verbs with Dental Suffix

If clause has been shortened, it is significant to note that the constructions of sentence with when, while, once and if are followed by an '—ed' (dental suffix) form of the verb. For example,

(a) When emitted, neutrons travel at a high velocity.
(b) However, if slowed down to thermal speeds, their probability of capture is greatly increased.

In technical English, cause words such as because, since, as, etc., are employed for explaining manners, etc. The writers are anxious to communicate their verifiable truths through very concise forms, and these constructions readily do the same. Again, the construction of the passive relative is very common in technical writing.

a) The petrol mixes with a steam of air blown over it.
b) There is a throttle valve operated by the accelerator.

"In order that this heat energy should not be wasted the steam is condensed and passed back to the boiler. The condensate is usually reheated, so that it may be circulated back to the boiler." Infinitive of result, though used only a few verbs like form, produce, etc., is employed to indicate the result of action previously stated as in the subsequent constructions:

(a) The sand and gravel are combined chemically to make a satisfactory aggregate.
(b) Hydrogen and oxygen are combined chemically to form the molecule H_2O.

Helping Verbs

Verbs like will, can, may, should, etc., have very special functions to perform in scientific writing. 'Will' shows simple futurity and 'is going to' is not used for this purpose. "Production of the new machine will commence next year." Here 'will' stands for simple futurity. 'Will' also shows capability like 'can'. "These planes can or will fly at 800 miles per hour." In another context, 'will' may show what always happens.

"This metal will resist temperature. Good lubrication will reduce the friction." Now it will be clear from the above examples that 'will' in these two sentences cannot be replaced by any other verb to express the same idea. What happens sometimes may be indicated by 'may' and 'can', and here the boundary layers give way and conjoin the two and make them serve the same purpose.

'Should' is an important auxiliary used in technical writing and while issuing important instructions to the operators, technicians and laboratory assistants, this auxiliary is employed with great facility. The same structure is enlarged by 'so' or 'thus' as in the following:

"The houses are made of wood. Houses so constructed are much cheaper to build." Here 'so constructed' refer back to the information given just before. As past participle is usual construction in scientific writing as in the following sentences:

"Natural uranium, as used in the refining plants, is a solid." "The uranium, as used in the reactor, is in the form of the thin rod." "The bridge, as originally planned, would have been expensive." Past participles of transitive verbs used as free adjuncts, though not

very common, used in scientific writing as in the following example:

"A second jet is provided, fed from a well open to the atmosphere and supplied with petrol from the float Chamber."

Needless to say, that the stem plus dental suffix used as past tense or past or perfect participle needs an attempt at classification by establishing boundaries between the adjunct areas. Zandvoort subtly points out: "When the idea of action predominates, the group to be past participle form the category of the passive voice" (Zandvoort, 1975) and "a verbal group consisting of one of the forms of to be plus the past participle of a transitive verb may denote an action undergone by the subject of the sentence. The construction is known as the passive voice." The language of science is full of these passive constructions with past or perfect participles and they vividly describe the scientific operation or processes (Singh, 1988).

Infinitive

The idea of function is common in science. It is more or less similar to the idea of purpose but the idea of function emphasises the use rather than purpose. "The function of super heater is to raise the temperature of the steam. The super heater serves to control the speed of the engine." In both these sentences it is the use rather than function that is being emphasised. The idea of purpose is, however, emphasised by in order 'so as, etc.' as in the following examples:

"A flux should be applied to the heated metal to prevent oxidation."

'Should' is also used to denote specification when it is required that:

(a) The steel should not contain more carbon.
(b) The diameter should not exceed one fourth of an inch.

Again, what is expected to happen is also indicated by the use of 'should' as in the following construction: "The process of cooling should continue for hours."

With the discussions above it becomes amply clear that the functional aspects of verb are very essential in scientific literature. The authors and teachers of scientific manuals, books, research papers and reports ought to be very mindful about their choice of verbs and so should the students emulate during their training. Their approach should neither be casual nor cavalier but trained and discriminatory in the choice of verbs. The dynamism of verbs as discussed above can go a long way in making a scientific writing precise and effective. Ambiguity is a bane in the domain of science which can be avoided with a trained choice of verbs. Discrimination and discretion in handling verbs that overlap and can potentially obscure the meaning, verbs with '—ing' endings, phrasal verbs, verbs with dental suffix, helping verbs and infinitive is advocated and recommended.

Conclusion

The different behavioural patterns or verbs as analysed in the preceding paragraphs show that the English of the sciences is an important part of the context of modern English. One of the characteristics of modern English is to give an idea as exactly as possible with the help of such choice and disposition or words as will achieve this economically. The language of science represented as a phenomenon preceded by activity is exactly trying to communicate the same by subscribing to the view of Confucius (551–479 BCE) that – if what is said is not what is meant, then what ought to be done remains undone.

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